COMBUSTION TURBINE STANDARD OPERATIONAL PRACTICE MANUAL

JOB DESCRIPTION:

Quantify heat rate/efficiency for Greenwood units 1-4, in accordance with requirements for the Fuel Adjustment Clause (FAC) as described in 4 CSR 240-3.161 (2)(P).

PROCEDURE NO.: GEC-Testing-Heat rate **LOCATION:** Greenwood

DATE: 9/17/07 **REVISION NO.:** 0

Information/Background:

Initial space below as steps are completed.

1. _____Testing shall be conducted at least once every 24 months.
2. _____There shall be a 15 minute settling period before the 2-hour test begins. The unit shall be within 5% of the target load at Base Control throughout the settling period. Only minor changes in unit control shall be made during this time as required to bring the unit into normal, steady-state operation.
3. _____Any deviations from load shall be noted on Data Sheet 1.

Operational Steps:

4. _____Determine proper testing conditions. If done during Southwest Power Pool (SPP) Operational Test, ambient site conditions must be met and test performed in the summer months (June – September). If not performed in conjunction with the SPP test, determine when instruments have been recently calibrated and minimal equipment out of service, etc. If there is equipment out of service, these items shall be noted on Data Sheet 1.
5. _____Notify System Operations of test date/time.
6. _____ Attach completed Maintenance Request (MR) for instrument calibration. Instruments that shall be calibrated prior to test include: watt meters, gas pressure and temperature, fuel flow, compressor discharge pressure.
7. _____Note the fuel supply used during the test. Only one fuel source shall be used during the test period.
8. _____If fuel is gas, notify gas supplier of testing schedule.
9. _____Start evaporative coolers, if available.
10. _____Remove the unit from Remote Control.
11. _____Initiate the Base Control sequence.

12. _____Raise load for 15 minute settling period and continue holding for 2 hour test period.
13. _____Begin hourly gas/oil Btu value sample collection by drawing a sample of fuel from the test port and sending to a testing facility or online analyzer, if available.

    Initial below that sample was collected.

    _____Settling _____Hour1 _____Hour 2
14. _____Begin hourly data collection according to Data Sheet 1.

    Initial below that data was collected.

    _____Settling _____Hour 1 _____Hour 2
15. _____Review the data hourly to determine if test data is reasonable and accurate. If inaccurate, test will be stopped and performed at a later date.

    Initial below that data was reviewed and is accurate.

    _____Settling _____Hour 1 _____Hour 2
16. _____At completion of test, notify System Operations and reduce/release load for remote control operation.
17. _____Notify gas supplier of test completion.
18. _____At test conclusion, compile data.
19. _____Evaluate data using the Units Correction Curves.
20. _____Complete preliminary test calculations using in-house/fuel supplier fuel Btu values. Record results on data sheet. Heat Rate results will be averaged over the testing period.
21. _____Compare baseline and all previous year's data to actual test results and determine if adequate/consistent.
22. _____Once fuel sample Btu value is received, complete final averaged heat rate calculation.
23. _____Include an executive summary of the findings with the test documentation.
24. _____Attach copies of data sheet and Greenwood Combustion Turbine Log.
25. _____Forward to appropriate contact for the Aquila Regulatory Department.

SAFETY: All plant personnel shall follow Plant Safety Procedures

CLEARANCE: None required

PERSONNEL: Operator, System Operations

EFFECTS ON OTHER EQUIPMENT: None.

Combustion Turbines - Greenwood
Heat Rate Test
Data Sheet 1

		Collected by:			
		Hour	Settling	1	2
		Time			
Gross Megawatts		MW			
Station Use MW		MW			
Net Megawatts		MW			
MVARS		mvars			
Ambient Air Temperature		°F			
Wet bulb temperature		°F			
Dry bulb temperature		°F			
Barometric Pressure		INHG			
Fuel supplier	SS/PanHandle/MGE				
Btu value of gas	As reported by Gas Supplier	Btu/mcf			
Btu value of gas	Onsite analyzer/Outside Lab	Btu/mcf			
Btu value of oil	Preliminary	Btu/gal			
Btu value of oil	As reported by lab	Btu/gal			
Fuel flow - gas		MCF			
Fuel flow - oil		gallons/hr			
Fuel Temperature		°F			
Fuel Pressure		psi			
Gross Heat Rate Calculation	preliminary	Btu/KWH			
Gross Heat Rate Calculation	final w/ lab results of fuel	Btu/KWH			
Water injection		gallons/hr			
SO_2 emissions		lbs/hr			
NO_x emissions		lbs/mBtu			
Compressor					
Inlet Temperature		°F			
Discharge Temperature		°F			
Inlet Pressure		psi			
Discharge Pressure		psi			
Pressure ratio					
Compressor efficiency		%			
Turbine					
Exhaust Temperature		°F			
Exhaust Pressure		psi			
Evaporative cooler on/off					
Wheel space temperatures		°F			
Inlet					
Inlet pressure		psi			
Outlet pressure		psi			
Notes: including list of equipment out of service					

Example Gross Heat Rate Calculation =

Fuel burned (MCF) * fuel higher heating value (Btu/MCF) / gross MW generated

Data collected by:	Reviewed by:	Approved by:

Written by: Kim Weir

Plant Manager: Tom Miller